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स्वचल टायर — मरम्मत के लिए पूर्व उपचारित पैबंद — क्रॉस प्लाई/रेडियल प्लाई टायर और भीतरी ट्यूबें — विशिष्टि

(पहला पुनरीक्षण)

Automotive Tyres — Precured Patches for Repairing Cross Ply/ Radial Tyres and Inner Tubes — Specification

(First Revision)

ICS 83.160.10

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Automotive Tyres, Tubes and Rims Sectional Committee, TED 07

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Automotive Tyres, Tubes and Rims Sectional Committee had been approved by the Transport Engineering Division Council.

This standard was first published in 2004. This standard has been revised to keep pace with the latest technological advancement in the field of repair patches for repairing tyres and tubes. This standard has been undertaken after due consideration of the practices prevalent in the industry. Following are some of the salient features of this standard:

a) Patch dimension table has been divided in two parts to accommodate bias and radial patches separately;
b) Properties of rubber base material used for calendaring fabric used for patches has been done away with;
c) Several requirements as per table for physical properties for black vulcanizing cement has been done away with; and
d) Typographical errors have been corrected and appropriate words have been added to convey the correct meaning.

In this standard S1units have been used, the unit of force, in Newton (N), of tyre load, in kilogram (kg) and of pressure, in Pascal (Pa). Their relationship are given below for information:

1 kgf = 9.806 65 N (exactly)
= 9.81 N (approximately)
= 10 N (within 2 percent error)
1kPa = 0.01 kgf/cm^2 (within percent error)
1 kgf/cm^2 = 98.066 kPa

NOTE — Values of kPa rounded to the nearest practical unit.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

AUTOMOTIVE TYRES — PRECURED PATCHES FOR REPAIRING CROSS PLY/RADIAL TYRES AND INNER TUBES — SPECIFICATION

(First Revision)

1 SCOPE

This standard prescribes the requirement for precured repair patches intended for repairing pneumatic tyres and inner tubes for tyres.

2 REFERENCES

The following standards contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
3400	Methods of Test for vulcanized rubber:
(Part 1) : 2012	Tensile stress strain properties (*second revision*)
(Part 2) : 2014	Rubber, vulcanized or thermoplastic — determination of hardness (Hardness between 10 IRHD and 100 IRHD)
(Part 9) : 2014	Rubber, vulcanized or thermoplastic — Determination of density
(Part 17) : 1974	Tear strength — Angular test piece
4910 (Part 2) : 1989	Tyre yarns, cords and tyre cord warpsheets made from man-made fibres — Method of test linear density warpsheets made from man-made fibres — Method of test: liner density (*first revision*)

3 DEFINITIONS

For the purpose of this standard, the following definitions shall apply.

3.1 Precured Tyre Patch (Dual Cure Patch) — This is a cured rubber assembly reinforced with rubber coated fabric plies as per manufacturer's specification. For vulcanization with tyre, cured assembly is provided with a specially formulated face gum or unvulcanized chemical bonding gum, which is protected by polythelene or metalized film.

3.1.1 *Cold Bonding* — Vulcanization at room temperature is initiated by treating these unvulcanized bottom layer of the patch with specially prepared chemical vulcanizing solution. The prepared inner surface of tyre must also be treated with chemical vulcanizing cement for effective cold bonding.

3.1.2 *Hot or Precure Process* — When using these patches while retreading, the inside of the tyre can be treated with black vulcanizing cement whereas the patch has to be given a coat of chemical vulcanizing cement. Some repair patches may only require the use, if a chemical vulcanizing fluid without the use of black vulcanizing cement. Some repair patches may only require the use of a chemical vulcanizing fluid without the use of black vulcanizing cement.

NOTE — Patch with face gum bottom layer is compatible with the retread system, it can be treated with black vulcanizing cement when used with heat in conventional or precure retreading.

3.2 Precured Repair Patch for Tube Repairs — A cured repair patch laminated with a chemical cushion gum protected by polyethyelene film, or a cured patch with an unvulcanized chemical bonding gum at the bottom protected by a metal foil or metallized film.

3.3 Chemical Patch — Chemical patch consists of a top layer, plies, a bottom layer and a special gum layer. The assembly is then cured and supplied as chemical patch. In this case the vulcanization is activated by using a special self vulcanizing fluid on the patch before application to the tyre.

3.3.1 Chemical patch shall have the following requirements:

a) No possibility of any air pockets, and
b) Since vulcanizing process will begin only on application of accelerator its shelf life can be prolonged.

3.4 Chemical Vulcanizing Cement — This is a specially formulated rubber based cement which is used with precure chemical patches to facilitate cold bonding with tyre or tube.

3.5 Face Gum Patch — The face gum patch consists of specified number of coated fabric layers sandwiched between rubber compound layers. The assembly is then cured and topped with a layer of gum compound.

3.6 Cleaning Solvent — It is an organic solvent used for dissolving dirt and grime especially rubber dust. It also acts as cleaning solvent for better adhesion of patch to be used after buffing/brushing and before application of vulcanizing cement and the patch.

3.7 Black Vulcanizing Cement — Black vulcanizing cement is applied on the buffed casing prior to application of precured patch. This acts as an adhesive between the patch and the carcass and/or cushion. A base stock with natural rubber and other required chemicals/ingredients is made and mixed with rubber solvent in a cement mixing churn. The resultant solution should have uniform viscosity and required total solid content (TSC).

NOTE — Black cement is a building aid to help keep the repair in contact with the tire until vulcanization of the cushion layer to the tire is complete. New systems are being developed that greatly reduce or totally eliminate cements.

4 TESTS

4.1 Appearance

The patch shall be free from wrinkles kinks and air trapings.

4.1.1 *Classification*

The patches are to be suitably classified as per the use on cross ply tyres, radial tyres and tubes and also as per suitability for various injury sizes.

4.1.2 *Dimensions*

Every manufacturer shall recommend the specific size of the patch for specific size of injury corresponding to the size and ply rating of the tyres. For guidance, patch dimension are given in Tables 1 and 2.

4.2 Black Vulcanizing Cement

The cement shall have uniform brushable consistency, free from lumps of undissolved rubber and sedimentation. Five litre sample shall be drawn for testing.

4.3 Type of Material for Tyre Patch

Reinforcement material shall be nylon (Bias) or aramid, polyester or rayon (Radial) of a suitable denier and EPI warpsheet and square woven (small patches) to give reinforcement to the tyre injury and flex in operation. Cord strength of 8 kg minimum is recommended.

Table 1 Patch Dimension – Radial Tyre Patches (for Guidance Only)

(*Clause* 4.1.2)

Sl No.	Injury Size		Minimum Number of Plies	Minimum Dimensions of Patch (Length and Width) mm	Ply Dimensions
	inch	mm			
(1)	(2)	(3)	(4)	(5)	(6)
i)	1/8	3	1	75 × 55	45 × 22
ii)	1/4	6	1	110 × 66	65 × 28
iii)	1/4	6	1	137 × 80	82 × 36
iv)	3/8	9	2	117 × 71	72 × 30
v)	3/8	9	2	160 × 80	105 × 40
vi)	0.5	12	2	221 × 78	150 × 35
vii)	3/4	18	3	197 × 110	125 × 52
viii)	1	25	3	260 × 130	195 × 85
ix)	0.5	36	4	344 × 135	265 × 85
x)	1 .5 - 2	36-50	4	407 × 145	345 × 85

NOTE — The type of yarn material shall be polyester and denier shall be 1 000/2.

Table 2 Patch Dimension – Bias Tyre Patches (for Guidance Only)

(*Clause* 4.1.2)

Sl No.	Injury Size		Minimum Number of Plies	Minimum Dimensions of Patch (Length and Width)	Ply Dimensions
	inch	mm		mm	
(1)	(2)	(3)	(4)	(5)	(6)
i)	1/8	3	1	75	42
ii)	1/4	6	1	89	45 × 18
iii)	3/8	9	2	108 × 108	55 × 29
iv)	1/2	12	2	161 × 161	90 × 50
v)	3/4	18	4	188 × 188	115 × 60
vi)	1	25	6	262 × 262	165 × 75
vii)	1 .5 - 2	36-50	6	311 × 311	210 × 85
viii)	2-3	50-75	6	363 × 363	270 × 110
ix)	3-4	75-100	8	384 × 384	300 × 110
x)	4-5	100-125	8	453 × 453	350 × 205

NOTE — The type of yarn material shall be nylon and denier shall be 840/2.

4.4 Physical Properties

The physical properties of all material namely, patches and vulcanizing cement shall be as per requirements given in Tables 3 and 4. Procedure for curing and preparing specimen for adhesion test is given in Annex A.

Table 3 Physical Properties for Patches

(*Clause* 4.4)

Sl No.	Nature of Test	Requirement
(1)	(2)	(3)
i)	Appearance	The material shall be free from dirty moulding, blisters, air traps and kinks
ii)	Dimensions	As agreed to between the manufacturer and the purchaser
iii)	Peeling strength between patch and substract	5 kgf / 25 mm, *Min*
iv)	Tube repair patches shall be tested using inflator device for debonding and gripping of the patches cured at room temperature by black part shall not be more than 3 percent in 8 h duration	

NOTE — Tests at Sl No. (iii) and (iv) shall be carried out after 24 h of application for chemical patches cured at room temperature and for heat cure patches, after attaining the room temperature.

5 ACCEPTANCE OF MATERIAL

The material offered shall conform to the requirements given in this standard in full. The tests shall be carried out on the parts directly or on the specimen prepared from the component. If the sample fails in any of the tests the material shall be considered as not having met the requirement of this standard.

6 SHELF LIFE

6.1 All material shall render satisfactory performance and shall meet the physical properties requirement as given in Table 1, Table 2 and Table 3, when tested within 6 months for face gum patch, 12 months for chemical patch, and 6 months for vulcanizing fluid/cement from the date of patch manufactured.

6.2 It is recommended that the manufacturer supply material within 15 days from the date of manufacture.

6.3 The material shall be transported in a manner protecting it from any physical damage during transit.

6.4 Area of storage shall preferably be cool and dry. The surrounding area temperature shall not exceed ambient temperature. The maximum ambient temperature in the storage shall be 35°C.

Table 4 Physical Properties for Black Vulcanizing Cement

(*Clause* 4.4)

Sl No.	Nature of Test	Minimum Requirements	Method of Test, Ref to
(1)	(2)	(3)	(4)
i)	Appearance	The fluid shall have uniform consistency free from lumps of undissolved rubber and sedimentation	—
ii)	Specific gravity	1.13 *Max*	IS 3400 (Part 9) Method 'B'
iii)	Total solid content	a) 8 to 10 percent for spray consistency b) 10 to 12 percent for brushing consistency	
iv)	Cured pull test adhesion	5 kgf/25mm, *Min*	Annex A

7 USAGES OF MATERIAL

Patches and vulcanizing fluid/cement shall be used of the same manufacturer.

8 PACKING AND MARKING

8.1 Material shall be suitably packed in card board boxes or in poly bags to withstand transit and storage handling.

8.1.1 *Vulcanizing Cement*

Collapsible aluminium or multilayer tubes (for small quantity) or in wide mouth 1 litre capacity tin or as agreed upon.

8.2 The packed containers tins shall be labelled/printed with the following:

a) Name of the manufacturer and/or trade-mark,
b) Quantity,
c) Size of patch and application,
d) Month and year of manufacturing, and
e) Expiry date.

8.3 Each patch shall be marked with the following:

a) For tube patch:
    1) Manufacturer’s trade-mark, and
    2) Size.
b) For tyre patch:
    1) Manufacturer’s trade-mark,
    2) Type of patch and its size, and
    3) Arrow indicating the direction of fitment.

9 BIS CERTIFICATION MARKING

The product may also be marked with the Standard Mark

9.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act,* 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

ANNEX A

(*Clause* 4.4)

PROCEDURE FOR CURING AND PREPARING SPECIMEN FOR ADHESION TEST

A-1 ROOM TEMPERATURE CURE

A-1.1 Take a piece of strong cured rubber sheet of about 15 mm thickness or preferably a Piece of rubberized conveyor belting of equivalent size of the patch. A substrate material can be produced by the company testing the materials by laminating two or more layers of reinforcing tyre cord and a top layer of butyl or other suitable rubber. This sheet of laminated material is then cured into a usable substrate that can be cut to size and buffed for adhesion testing.

A-1.2 Gently buff the surface with a 32 grit carbide rasp to produce a fresh rubber surface with a texture similar to the RMA 2 standard.

A-1.3 If recommended by the repair patch manufacturer, clean the buffed surface thoroughly with a solvent and allow the solvent to dry.

A-1.4 Apply the chemical vulcanizing cement on the buffed surface and allow it to dry for 10 to 15 min.

A-1.5 If recommended by the repair patch manufacturer, peel the backing from the patch specimen and apply one even coat of chemical vulcanizing cement and allow it to dry for 10 or 15 min.

A-1.6 Place the release paper covering half of the cemented rubber piece.

A-1.7 Place the cemented patch on top of this arid press well without trapping air.

A-1.8 Place a small weight of about 5 kg on the assembly to ensure proper contact.

A-1.9 Allow the assembly to cure undisturbed for about 24h to 48h or as per the manufacturer’s recommendation.

A-l.10 After curing, cut the assembly in strips of 25 mm width.

A-l.11 Clamp the specimen between the fixed and the moving jaws of a tensile tester and peel the specimen, apart at a speed of 50 mm/min.

A-l.12 Note the peaks of force required for peeling while the specimen is being pulled. It may be necessary to make small nicks with a sharp knife to facilitate peeling along the bond surface.

A-1.13 Since the strips are of 25 mm width, the values obtained are in kgf. The value of the lowest peak should not be less than 5 kgf/25 mm.

A-2 HEAT CURE

A-2.1 Prepare the specimen as per **A-1.1** to **A-1.8** in the room temperature cure test. Follow the repair patch manufacturer's recommendations for proper use of cement that is required for heat cure repair.

A-2.2 Place the assembly in a specifically designed diaphragm press or in an autoclave with proper protection.

A-2.3 In the press, temperature should be maintained at 150 ± 1°C or as per manufacturer's recommendation. The pressure in the diaphragm should be 3 kg/cm and the cure time as per the manufacturer's recommendation.

A-2.4 In the autoclave the specimen should be cured at 100°C and 3 kg/cm pressure hot air for a period specified by the manufacturer (steam should not be used as the temperature of steam is more than 140°C at 3 kg/cm^2 pressure).

A-2.5 After curing test the specimen to adhesion as per **A-1.11** to **A-1.13**. The breaking of adhesion shall be such that, it takes out the surface of the substrate instead of breaking the bond.

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